Report Synopsis
for
San Francisco Bay to Port of Stockton
John F. Baldwin Ship Channel Phase III
Navigation Improvement Project

1.0 Stage of Planning Process

A General Re-evaluation R is being prepared to analyze various channel deepening depths and dredge material placement sites for the federal channel extending from the entrance of San Francisco Bay all the way to the Port of Stockton. There is a Milestone One (Alternatives) Conference tentatively scheduled for March 2013, where the PDT will present various Without Project analyses and the Tentatively Selected Plan (based upon preliminary With Project results from economics and engineering sections). Moreover, environmental team members will present the outcomes of initial discussions with both state and federal resource agencies, due to the sensitive environmental concerns involved with the San Joaquin River Delta.

2.0 Study Authorities

1960 - Supporting Document

Rivers and Harbor Act of 1960, Pub. L. 86-845, section 107 (Suisun Bay) – basis for 35' deep channel from Martinez to Avon

1965 - House Document 208, House Report 89-973 cited in

Rivers and Harbors Act of 1965, Pub.L. No 89-298, Section 301, 79 Stat. 1073

- Authorized modifications to 5 existing projects:
  - SF Harbor, Bar Channel – deepen to 55 feet [completed 1974]
  - Richmond Harbor, Channel and maneuvering area – construct new 45' deep, 600'wide channel, deepen to 45' maneuvering area (Richmond Long Wharf) [completed 1986]
  - San Pablo Bay, Mare Island Strait – Deepen to 45' Pinole Shoal Channel and maneuvering area at Oleum
  - Suisun Bay – Deepen to 45' up to Chipps Island, and to 35' beyond, widen to 600' upstream to Middle Point, and to 400' beyond
  - San Joaquin River – Deepen to 35' and realign the channel; place rock revetment on levees bordering Stockton Deep Water Channel; provide public recreation along improved channel [deepening completed 1988]
  - Vicinity of Antioch – provide a 35' channel access and turning basin to accommodate a potential harbor

1998 - House Report 105-190, as incorporated by Conference Report 105-271 and authorized in Energy and Water Development Appropriation Act of 1998, Pub L. No.105-62

- Appropriated $100,000 to initiate a reconnaissance study of deepening the Port of Stockton's main ship channel to forty feet, Sept 1998 (GI funds)
- Appropriated $250,000 to complete the environmental review and continue preconstruction engineering and design for the Baldwin Phase of the SF Bay to Stockton project. (CG funds)

2. 1 Additional Study Guidelines

Based upon a 1965 Congressional authorization, Phase III of the project called for deepening from -35 ft to -45 ft MLLW. However, the 1997 GRR resulted in a recommended plan of a crude oil pipeline, after consulting with South Pacific Division and HQUSACE and determining that the authorization language was flexible enough to recommend a pipeline alternative. This proposed pipeline project was ultimately never built.

The pipeline alternative was developed as a substitute for channel deepening. The 1997 GRR documents that as the result of an Issue Resolution Conference in April 1997, that SPN and SPD requested a Chief of Engineers concurrence that the Richmond Marine Link Pipeline System fell under the congressional authorization by meeting the following criteria: 1) the pipeline alternative would serve the same petroleum companies as would a channel deepening; 2) similar benefits (transportation cost savings) would be realized; 3) the pipeline alternative avoided negative impacts, including salinity intrusion, endangered species, and dredge material placement issues; 4) the pipeline alternative cost substantially less than channel deepening; and 5) there was no local support for a channel deepening alternative.

2. 2 Study Area

Phase I of the John F. Baldwin Ship Channel project (JFB) resulted in the construction of the San Francisco Bar Channel in 1974. The project created the Pacific Ocean offshore approach channel to the San Francisco Bar Channel Entrance. This shipping channel (55 ft deep—mean lower low water (MLLW) and 2000 ft wide) serves as the exclusive deep water ocean entrance to the San Francisco Bay. Completed in 1986, Phase II of the project deepened the central San Francisco Bay channel to -45 ft MLLW. Phase IV consisted of deepening the Stockton Deep Water Channel to -35 ft MLLW in 1988.

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This is not the case currently. In addition to the petroleum companies along the federal channel seeking transportation efficiencies, the Port of Stockton has grown substantially since the mid-1990s (much due to its acquisition of Rough & Ready Island from the Department of Navy in 2000) and is now keenly interested in obtaining the maximum depth authorized.

The 1988 Congressional authorization once again addressed the Stockton Deep Water Channel by directing that investigations begin to determine the feasibility of deepening that section of the JFB project (Phase IV) to -40 ft MLLW.

Thus, the current GRR being conducted will be addressing a single purpose project of deep draft navigation for the original Phase III stretch of channel up to -45 ft MLLW and the Stockton Deep Water Channel up to -40 ft MLLW. These deepening alternatives will be conducted in 2 and 3 foot intervals. Moreover, the pipeline alternative will also again be evaluated as it would avoid many of the challenges caused by channel deepening (environmental effects due to salinity intrusion into the Delta still being a concern).

FACT SHEET INFO

On August 11, 2010, U.S. Transportation Secretary Ray LaHood designated the Stockton Ship Channel, San Joaquin River, as part of "America's Marine Highway Program" for its significant contribution to the Nation's Economy. This designation of the 75-mile stretch of the San Joaquin River that runs from the San Francisco Bay to the Stockton Deep Water Ship Channel as a Marine Highway Corridor, officially connects the Port of Oakland, the fourth-busiest port in the Nation, to the Port of Stockton, and facilitates a bypass of the congested surface transportation system by providing a 100% water route to and from the Port of Stockton.

FUNDING HISTORY:

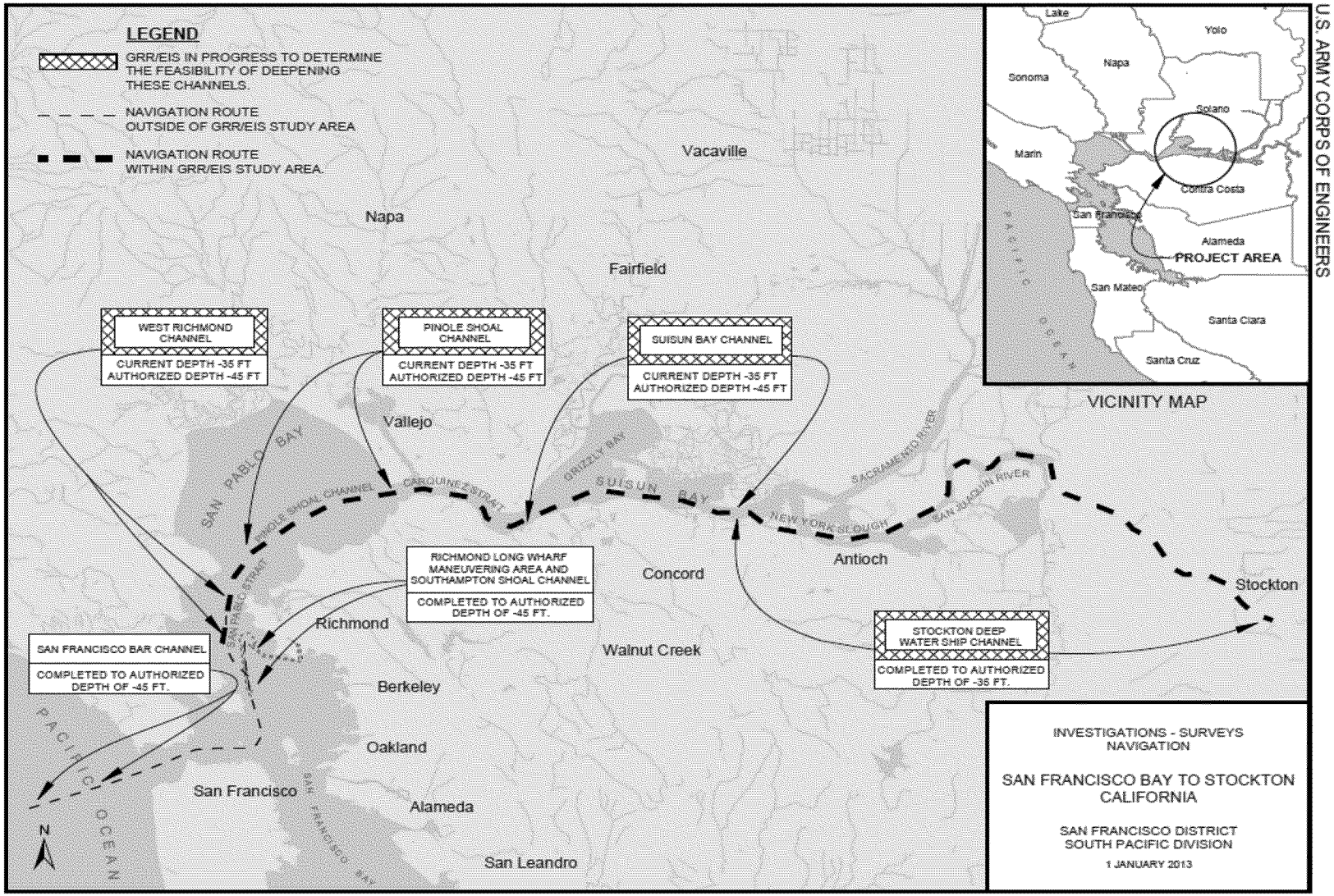
	Appropriation	non-Fed Contribution
FY02	$ 129,842	$ 53,515
FY03	$ 155,314	$ 48,053
FY04	$ 532,000	$ 183,667
FY05	$ 345,251	$ 129,501
FY06	$ 198,000	$ 66,667
FY07	$ 200,000	$ 66,667
FY08	$ 403,000	$ 117,938
FY09	$1,344,088	$ 265,584
FY10	$ 0	$ 172,292
FY11	$ 0	$ 0
FY12	$ 800,000	$ 266,667

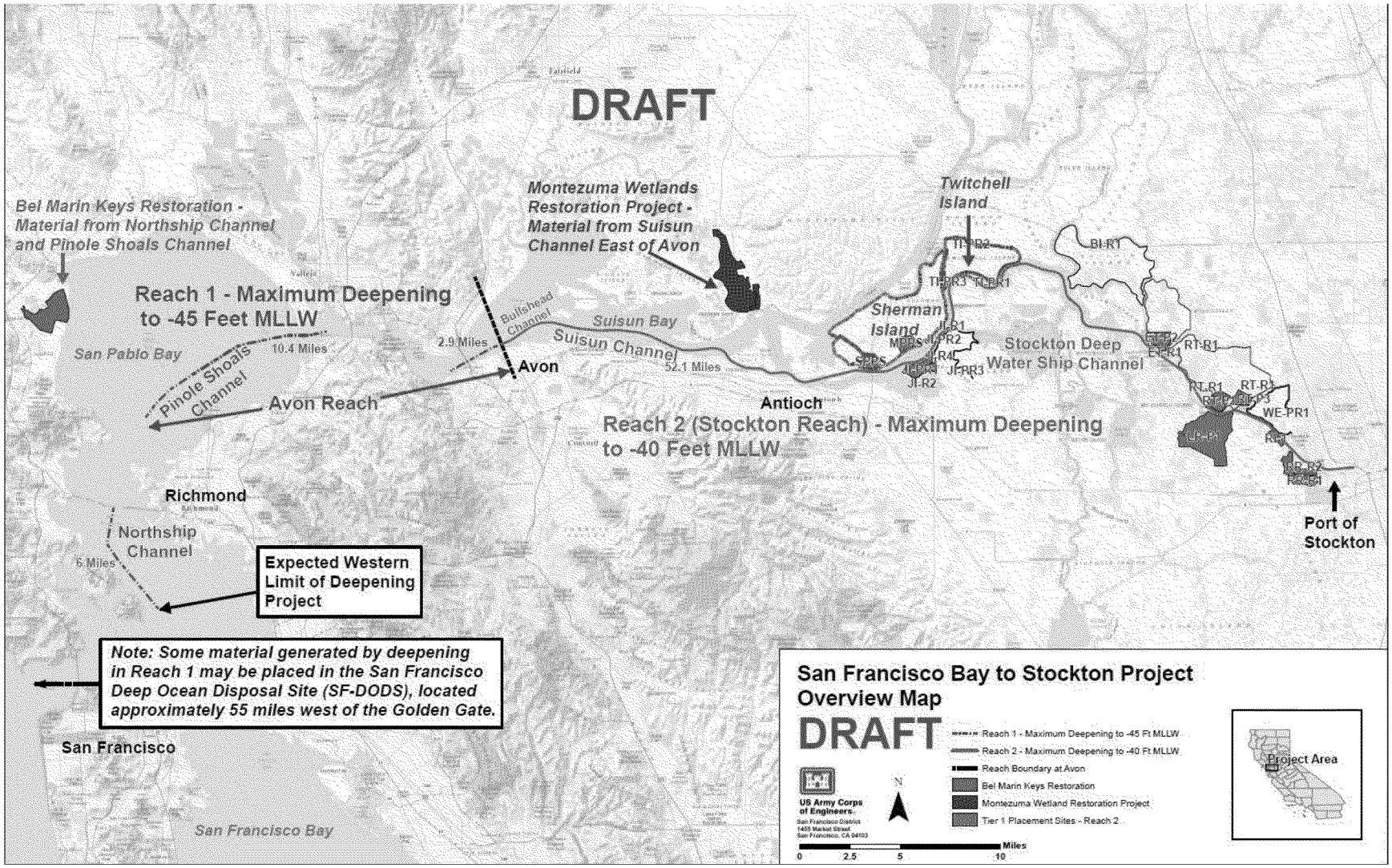
FY 02 - 12 ACCOMPLISHMENTS:

- Initiated a Design Agreement in July 2002 to cost share a General Re-evaluation Report (GRR) at 75:25.
- Aerial, topographic and hydrographic surveys of project area accomplished in 2006 ($750k).
- Initial evaluation of potential dredge material disposal sites made in 2007 ($125k).
- Perform water quality (salinity) modeling to assess potential impacts of deepening the navigation channel in 2008 ($680k).
- Initiated EIS/R contract in 2010 ($65k).
- Evaluating alternative channel depths and impacts to water quality in 2012. ($165k)
- Further evaluate potential dredge disposal sites in 2012 ($560k).
- Develop initial project economic benefits and construction cost estimates in 2012 ($330k).
- Total Project Expenditures to date: $ 4,544,000
- Cost share balance = 75% Fed, 25% non-Fed

2.3 Project Area

San Francisco Bay to Stockton Overview Map




DRAFT
Bel Marin Keys Restoration - Material from Northship Channel and Pinole Shoals Channel
Montezuma Wetlands Restoration Project - Material from Suisun Channel East of Avon
Twitchell Island
Reach 1 - Maximum Deepening to -45 Feet MLLW
San Pablo Bay
10.4 Miles
Pinole Shoals Channel
Avon Reach
2.9 Miles
Bullshead Channel
Suisun Bay
Suisun Channel
52.1 Miles
Avon
Sherman Island
Stockton Deep Water Ship Channel
Antioch
Reach 2 (Stockton Reach) - Maximum Deepening to -40 Feet MLLW
Richmond
Northship Channel
6 Miles
Expected Western Limit of Deepening Project
Note: Some material generated by deepening in Reach 1 may be placed in the San Francisco Deep Ocean Disposal Site (SF-DODS), located approximately 55 miles west of the Golden Gate.
San Francisco
San Francisco Bay
Port of Stockton
San Francisco Bay to Stockton Project Overview Map
DRAFT
US Army Corps of Engineers
San Francisco District
1455 Market Street
San Francisco, CA 94103
N
Reach 1 - Maximum Deepening to -45 Ft MLLW
Reach 2 - Maximum Deepening to -40 Ft MLLW
Reach Boundary at Avon
Bel Marin Keys Restoration
Montezuma Wetland Restoration Project
Tier 1 Placement Sites - Reach 2
Miles
0
2.5
5
10
Project Area

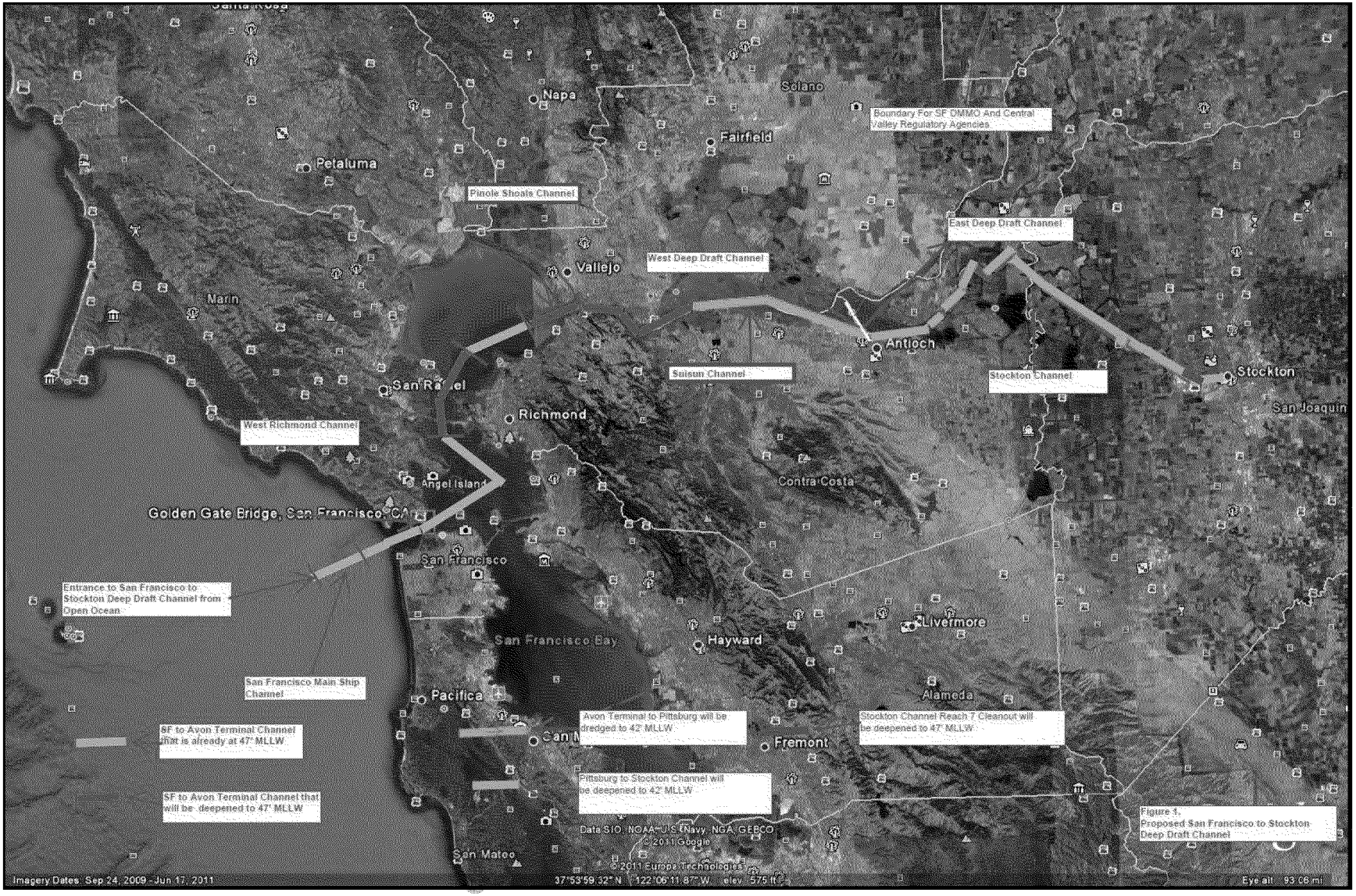


Figure 1.
Proposed San Francisco to Stockton Deep Draft Channel

3.0 Non-Federal Sponsor

The non-Federal Sponsor is the Port of Stockton (CA). According to their website (www.portofstockton.com):

"The Port is governed by a seven member Board of Commissioners; four commissioners are appointed by the City of Stockton and three commissioners appointed by the San Joaquin County. The Board establishes policies under which the Port's staff - supervised by the Executive Director - conducts its daily operations.

The Port of Stockton is a non-taxing independent local entity with business relationships in more than 55 countries around the world, bringing more than 4,500 jobs to Stockton and the greater San Joaquin Valley. These national and international businesses have brought nearly $2 billion in private sector investments to our community and generated more than $25 million in much-needed taxes for the City of Stockton and San Joaquin County in the last five years alone. The Port of Stockton is not a department of the City of Stockton or of San Joaquin County, and funding for its operations come income earned on the docks and from lease revenue generated on the Port of Stockton properties."

The Port is coordinating with the various petroleum companies situated along the western reach of the project area (roughly ending at Avon).

4.0 Problems/Opportunities

Reach 1/Western Reach (from SF Bay past Avon):

- Currently at -35' channel depth; authorized to -45' channel depth
- Tanker vessels with petroleum and related products must lighter and/or light-load in order to deliver to the refineries along the JFB channel.
- With additional depth, greater volumes to meet demand could be delivered safely by fewer Panamax-class vessels (already using the channel light-loaded).

Reach 2/Eastern Reach (from upstream of Avon to Port of Stockton):

- Currently at the authorized depth of -35' and authorized to study deepening up to -40' depth.
- Would need a congressional construction authorization to deepen beyond -35'.
- Panamax-class vessels currently navigating the Stockton Deepwater Ship Channel but light-loaded.
- Pilots use tides to get ships to the Port of Stockton, but experience tidal delays upon making the trip back to San Francisco Bay
- Dredge material may be used towards land management within the San Joaquin River Delta (specifically, for levee repair and/or rehabilitation and land subsidence)

Under current channel depths, ships are delivering petroleum products and other commodities light-loaded. In other words, ship classes (such as Panamax-class vessels) that are already using the channel

have additional payload capacity/operational drafts that cannot be safely used under the currently maintained channel depths.

However, one of the key concerns relates to salinity intrusion into the San Joaquin River Delta due to deepening. The Delta hosts a number of threatened and/or endangered species that could be adversely affected by additional saltwater; habitat could also be impacted.

5.0 Planning Goal/Objectives

The recommended plan will be based upon environmentally acceptable measures, sound engineering and construction, and reasonably maximized net NED economic benefits. The broad goals of the recommended plan are to 1) ensure safety for both present and future waterborne vessels traversing the John F. Baldwin Ship Channel, 2) increase efficient operations of vessels by reducing tidal delays and lightering, and 3) provide savings in waterborne commerce transportation costs.

- Identify efficiencies of O&M
- Identify shoaling hotspots and places that would greatly benefit from advance maintenance.
- Identify beneficial uses for the dredge material based upon the type of demand (habitat, levee use, etc.)
- Use the Vertical Team process to bring in scope and cost that results in a usable report that meets the Sept 2014 deadline that HQ considers commiserate with being nominated to the Executive Order's Pilot Program

6.0 Planning Constraints/Risks

There are likely to be several challenging issues as a result of the analyses conducted for this GRR. First and foremost will be environmental concerns, both state and federal. The proposed project would go through the ecologically sensitive San Joaquin River Delta. Additionally, channel deepening would allow saltwater to flow further upstream and thus potentially endanger several protected and/or endangered species and aquatic habitat. Thus, close and extensive coordination will have to be conducted between USACE environmental scientists, engineers, and a variety of resource agencies.

Another risk factor will be locating adequate placement sites for upwards of 35 million cubic yards of dredged material. Of course, the distance of placement sites from the channel will be a significant determinant of overall costs; and with scarcer federal and sponsor funding to pay for a project that will in all likelihood run into the range of hundreds of millions of dollars.

Much of the San Joaquin River Delta's farmland is kept dry by the levees that channel the river from Stockton to San Francisco Bay. Thus, any modifications to foundation loads along the channel banks whether on the surface (e.g., raising existing levees) or underwater (e.g., cutting channel slope toes) would have to be done carefully to prevent slope instability that might cause flooding to the adjacent

crops, buildings, people and public infrastructure. Moreover, a breach could result in a change of the overall salinity concentration in the San Joaquin River Delta.

Though the Port of Stockton seems to have weathered the Great Recession rather well (as their recent annual reports show), the national economy is still fragile. Should demand for the products coming into Stockton fall or if the world economy stalls and no longer demands US exports, the transportation costs savings that lead to economic feasibility (i.e. that benefits exceed costs) might not materialize as forecast.

In summary, the most pressing and apparent risks and uncertainties relate to minimizing adverse effects to ecological resources, finding engineering techniques to minimize salinity intrusion into Delta waters, maintaining levee safety and integrity during and after construction, using dredge material for beneficial use while also keeping project costs down, and demonstrating the current and future economic viability of the Port of Stockton as it pertains to national and world demand of products crossing its wharfs.

REACH SPECIFIC RISKS IDENTIFIED

Reach 1

- Salinity intrusion could affect ecological habitat (though not as great a risk as Reach 2 in the Delta) and water supply intake operations.
- Placement sites that will accept the particular type of sediment and has capacity to accommodate the estimated volumes.
- Sampling Analysis Plan—to assess the potential contamination of the dredge material.
- Mitigation and real estate costs not developed.

Reach 2

- Endangered Species Act concerns independent of salinity intrusion impacts
- Fish biggest concern: long fin and delta smelt
- Possible contaminants in dredge material
- Geotechnical concerns related to Delta levees by deepening/widening (for design, not two-way traffic) the ship channel
- Erosion concerns to levees with Panamax ships fully loaded.
- Could modifying existing O&M procedures solve any anticipated challenges as a result of channel improvement? For example, are there acceptable O&M measures that could help solve levee erosion concerns now?
- Mitigation and real estate issues/costs may be substantial. A mitigation currently being considered is restoration of thousands of acres of Suisun Marsh; preliminary costs are expected to be at a minimum in the $30M - $70M range.

- How might channel improvement affect the Stockton Islands study being conducted by Sacramento District?
- Salinity modeling assumes no Sacramento Channel deepening

FACT SHEET RISKS PREVIOUSLY REPORTED:

Dredge quantity and Disposal issues:

- An estimated 35 milion cubic yards of dredge material will need to be removed and deposited in as many as 15 environmentally-acceptable disposal sites along the project reach that extends 75 miles from the SF Bay to the Port of Stockton.
- A lack of existing disposal sites with the capacity required may reactivate the California Coastal Conservancy's previous interest in developing the Bell Marin Keys (BMK) property.

Water Quality Impacts:

- A 40' channel from SF Bay to Martinez (the oil facilities) and a 38' channel from Martinez to the Port would result in a significant change in the salt water content within the Delta. This would impact the drinking water quality at numerous water intakes for the entire State as well as countless protected species and habitat within the Region.
- Reaching an agreement from the many Stakeholders involved on acceptable mitigation measures to address these impacts is very difficult and costly. They include:
    - Habitat restoration
    - Construction and Operation of Tidal Gates
    - Additional Freshwater supply
- The costs for acceptable mitigation will have a significant impact on overall project cost.

Potential Levee Problem Areas

Notes:
1. Locations and areas of concerns were selected based on spatial constraints and existing conditions given a proposed template with 3H:1V slopes superimposed onto aerial photography (ESRI_Imagery_World_2D.jpeg) and 2012 bathymetry data.
2. Locations and areas of concerns related to placement site are not identified here.

LOCATIONS OF CONCERN DUE TO CHANNEL DEEPENING
Stockton Channel

December 2012

7.0 Formulating Alternative Plans

7.1 Management Measures

Management measure – deepen the federal channel up to the authorized depths (45' for the eastern/oil terminals reach; 40' for the Port of Stockton's Main Ship Channel. The related objectives that this measure addresses are to improve operational efficiencies of vessels and reduce transportation costs and, thus, free up economic resources for growth of the national economy.

Management measure – locate and use material disposal sites that provide beneficial uses, minimizes costs, and minimizes adverse impacts to environmental resources.

Reach 1 (Western) management measure—levee realignment (West Richmond alignment considered tentative/flexible)

Reach 2 (Eastern) management measure—select widening and or straightening in spots. Could alleviate some of the bar pilots nighttime/weather restrictions pertaining to vessels calling on the Port of Stockton.

Reach 2 management measures—possible structural measures to contain salinity intrusion:

- Gate at Three Mile Slough
- Modification of salinity control gate at Suisun Marsh
- Gate at "Frank's Tract"

7.2 Screening of Measures

- Effect on critical habitat for threatened/endangered species.
- Adverse construction impacts on existing levees that currently provide flood protection to the Delta.
- Salinity intrusion impacts to environmental resources.
- Economic transportation cost savings based upon historical and projected commodities
- Total project costs: construction, environmental mitigation (possible restoration of Suisun Marsh), real estate, and other associated economic costs such as interest during construction).
- Vertical Team agreement or not on assumptions made to get to Decision Point 1 by March 2013

7.3 Key Uncertainties (for the Risk Register)

- Salinity intrusion and its impact upon threatened/endangered species and/or habitat.
- Placement sites sufficient to accept upwards of 20+ million cubic yards of dredge material (and associated construction costs of at least $175 - $200 million).
- Construction methods for wet/saturated soils to avoid slope instabilities to flood prevention levees.

- The overall robustness of the national economy and aggregate demand that would ensure that commodity growth continues and will provide the necessary transportation savings benefits for economic feasibility.
- Future funding from both the US Congress and the non-Federal Sponsor to pay for the implementation of the Recommended Plan, which will likely be in the hundreds of millions of dollars.
- Benefit-cost ratios to make the Next Decision given that there is not a currently agreed upon/completed sampling and testing program (environmental/HTRW task currently being implemented).
- Document the concerns of salinity, endangered species, and geotechnical instability issues happening simultaneously as well as independent.
- Does this project fall under the category of "replacement project" or the authorized one? Policy issue that could be important for future budget requests
- Being nominated into a Pilot Program with condensed schedule could have trade-offs. What could be the consequences of meeting the HQ proscribed schedule of Sept '15 Chief's Report in regards to sequencing separable reach improvements and continued local support?

7.4 Initial Array of Alternative Plans

- Structural Alternatives – depending on the results of the salinity intrusion models, combinations of channel deepening of up to 45' west of Avon and up to 40' for the Stockton Channel with various disposal sites.
- Non-Structural – while none have been evaluated at this time, at a minimum changes in operational practices currently in use will be addressed as part of this GRR. Also, the oil pipeline alternative recommended in the August 1997 Report will be addressed (mainly explaining why that option is no longer acceptable/feasible.

7.5 Evaluation Array of Structural (Deepening) Alternatives

COASTAL ENGINEERING (Salinity & Dissolved Oxygen Modeling)

Salinity

The UnTRIM Bay-Delta Model (UnTRIM) is being used to simulate and evaluate potential impacts to hydrodynamics and salinity as a result of channel deepening of the San Francisco Bay to Stockton (Stockton) Deep Water Ship Channel (DWSC). The 3 – dimensional UnTRIM model is widely accepted and supported by local scientific communities and resource agencies, and has been approved for use for navigation studies by HQUSACE.

Two sets of dredging depths have been evaluated for this study: (1) 45/40 -- 45 ft MLLW to the west of the city of Avon and 40 ft MLLW to the east of Avon, and (2) 40/38 -- 40 ft MLLW to the west of Avon and 38 ft MLLW to the east of Avon. Two project components were also added to evaluate their

effectiveness in offsetting or reducing potential impacts to salinity intrusion induced by channel deepening: (1) restoration of Suisun Marsh and (2) installation of operable gate at Three Mile Slough. Suisun Marsh is located north of Suisun Bay. Three Mile Slough is at the northeastern corner of Sherman Island.

The following three potential impacts were simulated and evaluated: (1) the water quality objectives at water intake locations in the Delta, (2) the location of X2, and (3) the extent of the low salinity zone (LSZ). X2 refers to the distance measured from the Golden Gate Bridge to location within the San Francisco Bay or Sacramento-San Joaquin Delta (Bay-Delta) system where the bottom salinity of 2 psu (practical salinity unit) is measured. The LSZ refers to the habitat area that ranges from 0.5 psu to 6 psu within the Bay-Delta system. The D-1641 water quality objectives have been developed to control water quality for the safe use of commercial, agricultural, and industrial communities within the Delta.

The first set of model runs evaluated 45/40 dredging depths for the entire Stockton DWSC, along with both project components and the adjacent Sacramento Deep Water Ship Channel for the proposed depth of 35 ft MLLW. The results from these runs indicated that the restoration of approximately 3,000 acres of Suisun Marsh has the potential to offset some salinity intrusion impacts due to channel deepening by reducing the number of violations of D-1641 water quality objectives at the water intake locations, and by moving X2 towards the Bay. However, the installation of an operable gate at Three Mile Slough indicated adverse effects on X2 in the Sacramento Deep Water Ship Channel.

The second set of model runs will be completed by mid January 2013. These runs simulate and evaluate minimum acceptable channel depths (40/38) of the entire Stockton DWSC only, along with the restoration of approximately 7,000 acres of Suisun Marsh as the only project component considered. As of now, the preliminary results indicate that a shallower dredging depth and larger acreage of restoration of Suisun Marsh would further help offset impacts to salinity intrusion and increase the benefit received from LSZ. However, more efforts will be needed to evaluate biological and ecological changes associated with the simulated alternatives. It is recommended that communication with relevant resource agencies is held early to discuss this matter.

No model runs have yet to be conducted that only evaluates channel deepening to the west of Avon, or only evaluates channel deepening to the east of Avon. It is anticipated that either scenario would still require the inclusion of the restoration of Suisun Marsh as a project component to offset potential impacts to salinity intrusion induced by channel deepening.

Dissolved Oxygen

Impacts on dissolved oxygen (DO) due to channel deepening had been modeled in year 2010. The model from 2010 considered the 45/40 dredging depths without any project components. The model extended from the upper San Joaquin River to Jersey Point, where DO has been affected by several factors, such as flow diversion, agricultural return flow, discharge from waste water treatment plant, and channel deepening. Among these factors, it was found that channel deepening has the least impact

on DO. Preliminary simulation results indicated that the changes of DO due to 45/40 channel depth are insignificant. Further runs will have to be conducted in the future to assess impacts on DO due to selected channel depths and the inclusion of a project component, such as the restoration of Suisun Marsh.

ENVIRONMENTAL

1.0 Overview

This document summarizes the environmental approvals required for completion of a Report to the Chief of Engineers (Chief's Report) for the proposed San Francisco Bay to Stockton deepening project and includes a brief discussion of the risks associated with each permit. This section does not provide an exhaustive discussion of environmental considerations; rather, it highlights some areas of known concerns. It also provides a brief discussion of some of the state and federal Endangered Species Act (ESA) concerns that must be addressed during early technical coordination and ESA section 7 formal consultations.

2.0 Environmental Compliance Necessary for a Chief's Report

The USACE must ensure that all federal environmental permits are obtained prior to finalizing a Chief's Report. In addition, for reasons explained later in this document, to obtain a Consistency Determination under the federal Coastal Zone Management Act, the project proponents must also comply with the California Endangered Species Act (CESA) and California Environmental Quality Act (CEQA). Below is an overview of the environmental laws that must be complied with prior to obtaining a Chief's Report and constructing the project and any foreseeable constraints that will need to be resolved.

2.1 Federal Environmental Compliance

- ***National Environmental Policy Act (NEPA) (42 USC 4321 et seq., 40 CFR 1500.1)***

NEPA requires that an Environmental Impact Statement (EIS) be prepared that analyzes and discloses the potential effects on the proposed deepening project on the quality of the human environment. The EIS must also be prepared in accordance with the USACE's procedures for implementing NEPA, which are outlined in Engineering Regulation (ER) 200-2-2 (33 CFR 230).

NEPA Constraints:

Alternatives: NEPA requires that an EIS analyze a "range of reasonable alternatives" that could achieve the purpose and need of the project. The purpose and need should neither be too broad nor too narrow—a broad purpose and need could create unnecessary alternatives, whereas a narrow purpose and need could limit the alternatives.

EIS circulation and comment period: The time required from the decision to prepare an EIS to filing the final EIS normally should not exceed one year (46 FR 18037, March 23, 1981). Once a draft EIS is prepared, it must be circulated for a minimum of 45 calendar days (excluding federal holidays). Agencies or the public may request an extension to the review period; any extension would need approval from the District Commander. Comments received on the draft EIS must be responded to and incorporated into a final EIS. The final EIS must be circulated for 30 calendar days; this review period may also be extended by the District Commander. Responses to comments received on the final EIS are required only when substantive issues are raised which have not been addressed in the EIS.

Other environmental legislation: To the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*), the National Historic Preservation Act of 1966 (16 U.S.C. § 470 *et seq.*), the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*), and other environmental review laws and executive orders.

- ***Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531 et seq.)***

The federal ESA protects threatened and endangered species and their designated critical habitat from unauthorized take. Under section 7 of the ESA, the USACE must consult with the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Association's National Marine Fisheries Service (NMFS) (the Services) to obtain authorization to construct the project. Formal consultation begins when USACE provides the Services with a biological assessment (BA) and request for formal consultation and the Services determine that they have all relevant data required by 50 CFR § 402.14(c)—this generally means that the Services have all the necessary information to assess the potential effects of the action on listed and proposed for listing species and critical habitat and develop reasonable and prudent alternatives if the project would result in jeopardy to the species or adverse modification to critical habitat. The consultation process ends with the issuance of a biological opinion (BO) and incidental take statement (ITS) from the Services.

ESA Constraints

ESA consultation review period: Once the Services determine that they have all pertinent information to prepare a BO and ITS, formal consultation begins. Per the ESA regulations, the following timeframes must be complied with:

- Biological assessment: a BA must be prepared within 180 days following receipt of an official species list. This period may be extended with a written request stating the estimated length of the proposed extensions and reasons why.
- BA Submission and formal consultation: once the BA is submitted to the Services, the agencies have 30 days to respond to the USACE as to whether they concur or not concur with the findings in the BA. Formal consultation will not begin until the agencies determine that there is enough information in the BA and supporting documentation to prepare a BO.
- Draft BO Review: If requested, during the 135-day BO preparation period, the USACE may review the draft BO and provide comments. If comments on not submitted to the Services by the 125th day, then the Services are granted an additional 10 days to review the comments.
- Biological opinion: Once formal consultation begins, the Services have 90 days to submit a draft BO; however, they may use an additional 45 days, for a total of 135 days. Additional extensions may be agreed upon by the Services and USACE.

Best scientific data: The ESA requires that the best scientific and commercial data available be used to in the preparation of the BA. When data gaps exist, there are two courses of actions: (1) the USACE can extend the date of submission of the BA until sufficient information is developed for a more complete analysis (e.g., studies)—see *Additional Data*; or (2) the Services can prepare the BO with the available information, giving the benefit of the doubt to the species concerned—the risk cannot be borne by the species concerned. This could result in worst case scenarios that may not be necessary for the project, especially for listed fish species (high risk).

Additional data: When the Services determine that additional data would provide a better information base from which to formulate a BO, they may request an extension of formal consultation and request that the USACE obtain additional data to determine how or to what extent the action may affect listed species or critical habitat. The responsibility for conducting and funding any studies belongs to the project proponent, not the Services. The request for additional data is not to be construed as the opinion that the USACE has failed to satisfy the information standard of section 7(a)(2) of the ESA. If no extension of formal consultation is agreed to, the agencies will issue a biological opinion using the best scientific and commercial data available, giving the benefit of the doubt to the species of concern.

Additional data may include, but is not limited to: special status species surveys of placement sites and ancillary areas at specific times of the year; additional dissolved oxygen or salinity intrusion modeling; fish entrainment risk assessment studies; sediment sampling toxicity and bioaccumulation studies; sound attenuation studies; and suspended sediment transport studies. Additional studies could take a long time and be very costly; however, there is a significant risk to moving forward with an ESA consultation. Without the proper studies, the Services are required to give the benefit of the doubt to the species. This could result in unnecessary worst-case scenario assumptions, including jeopardy of listed species and adverse modification of critical habitat—especially for fish. Section 7(a)(2) of the ESA states that each federal agency…insure that any action they authorize, fund, or carry out is not likely to **jeopardize** the continued existence of a listed species or result in the destruction or **adverse modification** of designated critical habitat (high risk).

Note: The schedule and project compliance risk to the project of not having enough data evidenced by the ongoing ESA technical coordination for the Sacramento River Deep Water Ship Channel Deepening and Selective Widening Project between the USACE, Port of West Sacramento, USFWS, NMFS, and CDFW—especially for listed fish species, delta smelt in particular.

- **Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 USC § 1801 *et seq*)**

The MSFCMA require that the USACE consult with the NMFS on the potential effects of the project on the essential fish habitat (EFH) of commercial fisheries. Under the MSFCMA, these fisheries are grouped together and described in Fisheries Management Plans (FMP). In the project area, there are three FMPs for which the USACE must consult for; these include: Pacific Salmon FMP, Coastal Pelagic FMP, and Pacific Groundfish FMP. As part of the consultation, the USACE must prepare an EFH assessment that analyzes the potential effects of the action on EFH and EFH-managed species discussed in the FMPs. The EFH assessment would be completed concurrently with the BA. When the NMFS receives the EFH assessment and determines that there is enough information to assess the potential effects of the action on EFH, they will provide conservation recommendations to reduce the effects of the action on EFH. The conservation recommendations are not mandatory and the USACE will have discretion as to whether or not they implement the measures. However, they must notify the NMFS in writing what measures they will and will not implement, and provide justification for not implementing measures.

MSFCMA Constraints

MSFCMA time constraints: The USACE must submit an approved and accepted EFH assessment at least 90 days before a decision on the project can be made. Once NMFS determines that they have all the required information to analyze the potential effects of the action on EFH, they have 60 days to prepare a response that includes the conservation recommendations. USACE has 30 days to provide a detailed response to the conservation recommendations. If the USACE's response is to concur with the

conservation recommendations, then the response must be submitted at least 10 days before the final decision is made. In the case where the response is not consistent with the conservation recommendations, the response must include which measures will not be followed and scientific justification for any disagreements. If the response is inconsistent with an EFH Conservation Recommendation, the Assistant Administrator for Fisheries may request a meeting with the head of the USACE, as well as with any other agencies involved, to discuss the action and opportunities for resolving any disagreements (low to moderate risk).

Extension of consultation: If NMFS determines that additional data or analysis would provide better information for development of EFH conservation recommendations, they can request additional time for expanded consultation. If NMFS and USACE agree to an extension, additional information must be provided to NMFS, to the extent practicable. If no agreement is made to extend the consultation, NMFS must provide EFH conservation recommendations using the best scientific information available. This may result in an unnecessary worst-case scenario (low to moderate risk).

Best available information: The USACE and NMFS must use the best scientific information available regarding the effects of the action on EFH and the measures that can be taken to avoid, minimize, or offset such effects. Other appropriate sources of information may also be considered.

- ***Coastal Zone Management Act (CZMA) of 1972 (16 USC 1451 et seq.)***

The CZMA requires that federal actions in or outside of the coastal zone that affect any land or water use or natural resource of a state's coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the state coastal management programs (16 USC § 1456). Section 306 of the CZMA requires the state to develop a coastal zone management plan and section 6217 requires states with approved management programs to develop and implement coastal nonpoint pollution control programs; these programs must comply with sections 208, 303, 319, and 320 of the Clean Water Act (CWA) and the state coastal zone management programs.

In California, the approved coastal zone management plan is based on the provisions and policies of the McAteer-Petris Act, the Suisun Marsh Preservation Act of 1977, the San Francisco Bay Plan, the Suisun Marsh Protection Plan, and the California Coastal Commission's administrative regulations. In the project area, the San Francisco Bay Conservation and Development Commission manage the CZMA under the approved San Francisco Bay Plan.

To determine if the project is consistent to the maximum extent practicable with the CZMA, the project must be consistent to the maximum extent practicable with the San Francisco Bay Plan. The USACE will prepare a consistency determination (CD) analyzing the projects consistency with the San Francisco Bay Plan and submit it to BCDC. BCDC will either concur with or object to the determination. If BDCD objects with the determination, USACE can still proceed with the activity if they determine that the action is 'consistent to the maximum extent practicable' with the coastal management program. BDCD can appeal that decision to the courts or can request the Secretary of Commerce to mediate its dispute.

CZMA time constraints: USACE must submit a CD to BCDC at least 90 days before a decision on the action is made. Once BCDC determines that the CD is complete, they have 60 days to review the document and make a decision. They can extend the review period by 15 days, for a total of 75 days, if necessary.

California ESA compliance: BCDC will only concur with the CD if it is consistent to the maximum extent practicable with the San Francisco Bay Plan. In order to be consistent with the Bay Plan, BCDC cannot authorize projects that result in taking of any species that is listed as endangered or threatened under the state or federal ESAs or the federal Marine Mammal Protection Act, unless the project has obtained the appropriate authorizations from the managing agency. As such, for USACE to obtain federal CZMA authorizations, they must comply with the California Endangered Species Act (CESA) and obtain an incidental take permit (ITP) from the California Department of Fish and Wildlife (CDFW). Compliance with the CESA is discussed later in this document (high risk).

California Environmental Quality Act (CEQA) compliance: Per CEQA regulations, if a state agency permits a project, then the state's CEQA must be complied with. As discussed above, the project would need an approved CD under the federal CZMA, which would be issued by a state agency, the BCDC. Additionally, to obtain a CD under the San Francisco Bay Plan, USACE must obtain an ITP from the CDFW. In order for either of these state agencies to permit the project, CEQA must be complied with. Compliance with CEQA is discussed later in this document (high risk).

Mitigation: mitigation under the CZMA may be required; however, the project should be designed to avoid adverse environmental impacts to Bay natural resources such as to water surface area, volume, or circulation and to plants, fish, other aquatic organisms and wildlife habitat, subtidal areas, or tidal marshes or tidal flats. When measures to compensate for unavoidable adverse impacts to the natural resources of the Bay are not feasible, mitigation is required. Mitigation should, to the extent practicable, be provided prior to, or concurrently with those parts of the project causing adverse impacts. When compensatory mitigation is necessary, a mitigation program should be reviewed and approved by or on behalf of BCDC as part of the project. (Should a mitigation plan be required prior to permitting the project, this could lead to additional time and funding requirements—moderate to high risk).

- ***Fish and Wildlife Coordination Act (FWCA) (16 USC 661 et seq.)***

The FWCA requires that any federal agency that proposes a water resource development project must first consult with the USFWS, NMFS, and with the head of the appropriate state agency exercising management of fish and wildlife resources (the state agency is the CDFW). It requires that fish and wildlife resources receive equal consideration to other project features. The FWCA consultation involves informal and formal agency participation in all phases of project, including planning, construction, operation, and maintenance. It also mandates various surveys and investigations which must be documented and mitigation for impacts to non-ESA listed species habitat. The USFWS issues a Coordination Act Report that provides the required reporting and outlines and justifies mitigation. Project reports or decision-making documents subsequently prepared by the USACE must include the recommendations of the Services and the CDFW for protecting fish and wildlife. Where possible, the agency must incorporate recommendations in the project plans.

FWCA timing and cost: A scope of work needs to be prepared for the project and agreed upon by the USFWS and USACE. Additionally, upland placement sites and ancillary areas, as well as along the banks of the eastern portions of the channel, will need to be surveyed by the USFWS (and NMFS, CDFW, and USACE) to evaluate the existing habitat. These surveys may require a significant amount of time. Further, funding the USFWS to do the work mandated by the USFWS would come from the project funds. (Time risk—moderate to high; funding risk—??)

- ***Clean Water Act (CWA) (42 USC 7401 et seq.) Section 401***

Prepare this section. Determine the need for sediment testing and at what level? Risk level?

- ***Other Federal Environmental Legislation and Executive Orders***

Below is a list of other environmental legislation and Executive Orders that the project would need to comply with and possibly get approvals for prior to finalizing a Chief's Report. This is not an exhaustive list (moderate risk).

Other federal environmental legislation: Clean Water Act section 404(b)(1) analysis; Clean Air Act; Migratory Bird Treaty Act; National Historic Preservation Act; Archeological and Historical Preservation Act; Estuary Protection Act; and the Federal Water Project Recreation Act.

Executive Orders (EO) include: Protection of Wetlands—EO 11990; Federal Compliance with Pollution Control Standards—EO 12088; Environmental Justice—EO 12898; and Improving Performance of Permitting and Review of Infrastructure Projects—13604. This is not an exhaustive list.

2.2 California Environmental Compliance Necessary for a Chief's Report

- ***California Environmental Quality Act (CEQA)***
- ***California Endangered Species Act (CESA)***
- ***Porter-Cologne Act***

3.0 Federal and State Endangered Species Act

There are several species protected under various federal and state laws that inhabit the San Francisco Bay and Sacramento-San Joaquin Delta project area. This section provides a brief discussion of some of the listed species that may be affected by the proposed action, focusing on listed fish. It also provides an overview of some of the impacts to listed fish that may occur if the project were implemented. This is not an exhaustive list.

3.1 Established In-Water Environmental Work Windows

The San Francisco Bay and Sacramento-San Joaquin Delta have several environmental work windows established to protect sensitive species for the adverse effects of in-water work. Under the proposed project, in-water work would occur within the Central Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, and San Joaquin River (located within the Central Bay work window. Table 1 provides an overview of the water body dredging would occur in, the channels within each water body and the established work window for that water body.

Table 1 *Established Dredging Work Windows*		
Water Body	**Channel**	**Work Window**
Central Bay	West Richmond/North Ship Channel	June 1 – Nov 30
San Pablo Bay and Carquinez Strait	Pinole Shoal	June 1 – Nov 30
Suisun Bay	Suisun Bay Channel	Aug 1 – Nov 30
San Joaquin River (Central Delta)	Stockton DWSC	Aug 1 – Nov 30

3.2 Federal and State ESA Listed Species

This section provides a discussion of some of the state and federal ESA protected species that inhabit the project and may be affected by the proposed action. This section focuses on fish species; however, there are several protected upland and wetlands species that inhabit the project area and are not listed here. Table 2 lists the fish species that inhabit the project area, the federal and state status of each species, whether critical habitat is designated, and the presence of each species in the San Francisco Bay (Central Bay, San Pablo Bay, Carquinez Strait, and Suisun Bay) and the Stockton Deep Water Ship Channel (from the eastern most portion of Suisun Bay, through the San Joaquin River, to the Port of Stockton).

Table 2 *State and Federal ESA Protected Fish Species in the Project Area*							
Species		**Status**	**Critical Habitat**	**Presence in Bay**		**Presence in Central Delta** [1]	
				Adult	**Juvenile**	**Adult**	**Juvenile**
Central California Coast coho salmon	*Oncorhynchus kisutch*	FE, SE	Y			***Not present.*	
Central Valley spring-run Chinook	*Oncorhynchus tshawytscha*	FT, ST	Y	Mar–Aug	Oct–May	Jan–Mar	Oct–Mar

Table 2		*State and Federal ESA Protected Fish Species in the Project Area*					
Species		**Status**	**Critical Habitat**	**Presence in Bay**		**Presence in Central Delta** [1]	
				Adult	**Juvenile**	**Adult**	**Juvenile**
salmon							
Sacramento River winter-run Chinook salmon	*Oncorhynchus tshawytscha*	FE, SE	Y	Jan–Jun	Oct–Apr	***Nov–May migrates through the northern Delta to the Sacramento River; may stray into the Central Delta.*	Jan–Apr
Central California Coastal steelhead	*Oncorhynchus mykiss*	FT	Y	Nov–May	Mar–Jun	***Not present.*	
Central Valley steelhead	*Oncorhynchus mykiss*	FT	Y	Sept–Mar	Dec–Jun	Oct–May	Nov–Jun
Green sturgeon (southern DPS)	*Acipenser medirostris*	FT	Y	Feb–Jul	Year round	***Migrates through the northern Delta to the Sacramento River; may stray into the Central Delta. Information on distribution of green sturgeon in San Joaquin River is lacking.*	Year round
Delta smelt	*Hypomesus*	FT, SE	Y	Sep–Dec	Apr–Oct	Dec–Mar	

Table 2 State and Federal ESA Protected Fish Species in the Project Area							
Species		Status	Critical Habitat	Presence in Bay		Presence in Central Delta [1]	
				Adult	Juvenile	Adult	Juvenile
	transpacificus			***Adults begin upstream migration in December, juveniles move to the LSZ areas of Suisun Bay and the western Delta in June. Most spawning occurs in the North Delta in Cache Slough, Sacramento River, and the Sacramento River DWSC.*		***Historically abundant throughout the Delta. However, due to anthropogenic alterations to the Delta, delta smelt population densities are extremely low in the central and south Delta with most of the population residing in the North Delta and they are no longer found there in the summer and fall months.*	
Longfin smelt	*Spirinchus thaleichthys*	FP, ST	N	Jun–Nov		Nov–Jun	
				***Adults begin upstream migration to spawning grounds in November. Spawning occurs in the fresh water of the western Delta and includes areas in the Suisun Marsh.*		***Habitat in the Delta:* *Slightly upstream from Rio Vista in the Cache Slough/Sacramento River region and up to Medford Island on the San Joaquin River.*	
Tidewater goby	*Eucyclogobius newberryi*	FE	Y	*Considered extirpated.*			

[1] The Stockton Deep Water Ship Channel lies in the central Delta. Deepening this channel could directly impact listed fish within the San Joaquin River directly adjacent tributaries and sloughs within the central Delta. However, indirect; cumulative; interdependent; and interrelated impacts could occur to listed species in the north and south Delta.

3.2.1 Potential Effects on Federal and State ESA Listed Fish

Table 3 provides a brief overview of some of the potential impacts of the proposed project on fish species listed in table 2. It also discusses additional data that may be necessary to analyze the impact in order to support the impact assessment. Some of the data analysis is complete, while others are ongoing or have not begun.

Table 3 Potential Impacts to Listed Fish and Data and Analysis

Potential Impact	*Data and Analysis* [1]
Salinity intrusion and change of X2 location	Salinity modeling (ongoing)
Entrainment	Entrainment risk assessment
Contaminate exposure and bioaccumulation	Sediment testing (DRET, toxicity, bioaccumulation)
Dissolved oxygen	Dissolved oxygen modeling (completed)
Turbidity and suspended sediment	Sediment transport analysis (STFATE)
Other water quality parameters (temperature, pH)	Existing data
Migration impediments	Sediment transport analysis and noise monitoring
Noise	Noise monitoring recently conducted in SF Bay and Stockton DWSC (completed ERDC 2012)
Food availability and quality (foodweb alterations)	Existing data
Increased susceptibility to predation	Existing data
Alterations to critical habitat	Existing data
Alterations to habitat (rearing, foraging, spawning, migration)	Existing data

[1] Data and Analysis refers to if additional data should be obtained to support the ESA findings. For some items, the USACE is gathering or has obtained the data discussed. 'Existing data' indicates that there is likely enough data available to support ESA findings.

San Francisco Bay to Stockton Alternatives

Alternative - (Salinity Report Alternative Number)	Reach 1		Reach 2	Reach 1		Reach 2	Entire Project - Estimated Dredge Volumes (2 Ft Overdepth)	Total Estimated Cost ($)
	Northship Channel - Depth in Feet (Cost)	Avon Reach - Depth in Feet (Cost)	Stockton Reach – Depth in Feet (Cost)	Northship Channel - Estimated Dredge Volumes CY (2 Ft Overdepth)	Avon Reach - Estimated Dredge Volumes (2 Ft Overdepth)	Stockton Reach - Estimated Dredge Volumes (2 Ft Overdepth)		
1	No Deepening	No Deepening	No Deepening (-35)	0	0	0	0	0
2	-38 ($27 M)	-38 ($34 M)	No Deepening (-35)	1.7 M	2.1 M	0	3.8 M	$61 M
3	-38 ($27 M)	-38 ($34M)	-38 ($66 M)	1.7 M	2.1 M	7.6 M[a]	11.4 M	$127 M
4 (Alt 3)	-40 ($49 M)	-40 ($58 M)	No Deepening (-35)	3.1 M	3.7 M	0	6.8 M	$107 M
5 (Alt 4)	-40 ($49 M)	-40 ($58 M)	-38 ($66 M)	3.1 M	3.7 M	7.6 M[a]	14.4 M	$173 M
6 (Alt 2)	-40 ($49 M)	-40 ($58 M)	-40 ($92 M)	3.1 M	3.7 M	13.2 M[a]	20 M	$199 M
7	-43 ($105 M)	-43 ($113 M)	No Deepening (-35)	6.3 M	6.9 M	0	13.2 M	$218 M
8	-43 ($105 M)	-43 ($113 M)	-38 ($66 M)	6.3 M	6.9 M	7.6 M[a]	20.8 M	$284 M
9	-43 ($105 M)	-43 ($113 M)	-40 ($92 M)	6.3 M	6.9 M	13.2 M[a]	26.4 M	$310 M
10 (Alt 1)	-45 ($158 M)	-45 ($156 M)	No Deepening (-35)	9.2 M	9.3 M	0	18.5 M	$314 M
11	-45 ($158 M)	-45 ($156 M)	-38 ($66 M)	9.2 M	9.3 M	7.6 M[a]	26.1 M	$380 M
12 (Both Deepened)	-45 ($158 M)	-45 ($156 M)	-40 ($92 M)	9.2 M	9.3 M	13.2 M[a]	31.7 M	$406 M
13	No Deepening	Pipeline (Cost TBD?)	No Deepening (-35)	0	0	0	0	TBD?

Estimated dredge volumes are displayed millions of cubic yards, and estimated costs are displayed in millions of dollars. Unless otherwise noted, volume calculations were completed by Andrew Smith in November 2012, and based on 3:1 side slopes. Volumes include 1 foot and 2 foot overdepth.

[a] These estimated dredge volumes were used in the cost estimates, but may represent an underestimate.

SCREENING OF DREDGED MATERIAL PLACEMENT SITES

Deepening of the four channels that comprise the San Francisco Bay to Stockton Project has the potential to generate significant amounts of dredged material over a wide large geographic area. As a result, the planning process requires the identification and screening of potential dredged material placement sites that can be used to accommodate material from the array of alternative plans. The USACE initially commissioned a study to identify all types of placement opportunities along the eastern segment of the project area (Avon to Port of Stockton). The USACE then initiated its screening process with the fundamental premise to maximize beneficial use of dredged material (Beneficial use of dredged material provides tangible and intangible benefits that enhance the environment, the local community, and society. Beneficial uses include use of dredged material in applications such as environmental restoration, levee rehabilitation, construction, beach and shore protection, among many other uses.). Maximization of beneficial use of dredged material is a key goal of both the San Francisco Bay Long Term Management Strategy (LTMS) and the Delta LTMS. For the Sacramento- San Joaquin Delta beneficial uses are greatest for levee rehabilitation, reversal of land subsidence, wetlands restoration, and construction. The project area is here identified as two broad reaches, the western and eastern reaches. This summary report describes the screening process, as conducted for two distinct segments of the project site.

The process of screening potential dredged material placement sites is in the preliminary stages for the western reach which includes West Richmond, Pinole Shoals, and Suisun sections of the project. Several sites have been identified, including the Bel Marin Keys section of the Hamilton Wetlands Restoration Project, Montezuma Wetlands Restoration Project, and San Francisco Deep Ocean Disposal Site (SF-DODS). All sites identified here are determined to be potentially available although there is uncertainty surrounding some placement sites such as the Bel Marin Keys V (BMKV). All sites listed above with the exception of SF-DODS provide beneficial use of dredged material. At this time all sites listed above identified for the eastern reach remain potentially viable. More detailed logistics consideration and determination of cost for placement of dredged material at each location need to be further investigated in order to rank these sites in order of preference.

The process is further advanced for the eastern reach or Stockton Deep Water Ship Channel (DWSC) section of the project, where a there has been a comprehensive GIS-based analysis of characteristics associated with each potential placement site. The initial list of potential dredged material placement sites was compiled for USACE in December 2010, and included an analysis of 131 potential dredged material placement sites (USACE, 2010). Potential placement sites were classified into stockpile sites, placement and reuse sites, and reuse only sites. The stockpile and placement and reuse sites would be able to directly receive dredged material, whereas the reuse only sites would require dry sediments that could be used for construction purposes such as levee rehabilitation. The 2010 report also provided a GIS database of these potential placement sites, which included a number of characteristics designed to aid the screening process, such as type of material that could be received (wet vs. dry), capacity, and distance from the channel. Several Placement sites in the stockpile category identified in this report have been determined to provide beneficial use of sediment. These include Sherman and Twitchell

Islands where dredged material can be used for subsidence reversal of a critical location within the Delta.

In addition, another USACE effort as part of this study was vegetation and habitat mapping at the placement sites listed in the USACE 2010 report, and compiled the data into GIS format (USACE, 2011).

The screening process for the eastern reach began by overlaying placement sites and vegetation GIS databases, and classifying the sites into tiers based on proximity to the channel, capacity, and minimization of impacts to sensitive habitat. These sensitive habitats included a variety of riparian, wetland and open water communities, and a GIS analysis was completed to determine the sensitive habitat coverage at each placement site. Sites that met the beneficial use category and had minimal impacts on existing sensitive habitat were classified as "Tier 1" sites, which were defined as defined as beneficial reuse or stockpile sites within 10,000 feet of the DWSC and less than 10% sensitive habitat coverage. Sites within 10,000 feet of the DWSC were considered to be preferable because their proximity would minimize the cost and environmental impacts associated with transporting the dredged material long distances.

In the end, the GIS analysis identified 36 Tier 1 sites, which are undergoing further engineering analyses to determine which sites will be able to provide the necessary capacities for given reaches.

In addition, USACE is considering several other placement options for the material from the DWSC. The California State Department of Water Resources (DWR) has shown an interest in utilizing dredged material to restore elevations over large (>1,000 acre) sections of Sherman and Twitchell Islands (in addition to those identified in the USACE 2010 report), which have significantly subsided over the past century). In response, USACE is currently conducting engineering analyses at these islands to determine if material placement is a feasible option. However, vegetation mapping has not been completed for large sections of these islands, and further analyses of environmental impacts will be necessary. The USACE has also been contacted by a private developer, who has indicated an interest in using dredged material for construction activities.

Further screening based on engineering, logistics, and costs are currently underway for both of these broader reaches.

ECONOMICS

Historical Commodity Movements

JFB Ship Channel

Oil has been imported along the JFB Ship Channel since at least the late 19th century. There are currently five refineries in northern California, four of which are located within the project area. The four refineries are owned by Shell, Tesoro, ConocoPhillips, and Valero. The fifth (Chevron) is located nearby at the Port of Richmond.

According to the California Energy Commission, over the last ten years imports of crude oil to California have increased at an average annual rate of 1.2%[1]. While no explicit growth rate forecast was found in the Commission's latest available presentation from 2011, the Commission does stat that crude oil imports are expected to continue to grow over the next twenty or so years will grow at a relatively low rate. The Commission's prediction is that an increase in imports to California will be required to make up for the decline in California-sourced crude over time. Production of crude oil in California has decreased every year since 1995.

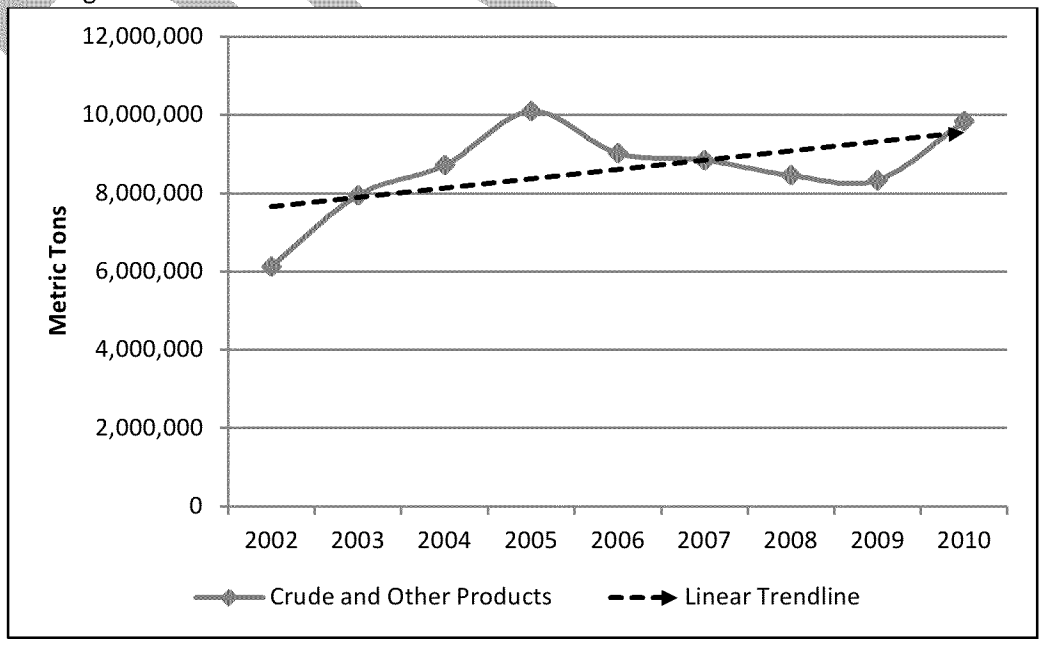
[1] http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-11_workshop/presentations/Crude_Oil_Import_Forecast_and_HCICO_Screening.pdf

The annual tonnage of crude and other oil product imported to the project area refineries between 2002 and 2010 is shown in the table and graph below.

Table 1: Tonnage of Crude and Other Oil Products

Year	Crude and Other
2002	6,134,940
2003	7,956,900
2004	8,721,160
2005	10,101,700
2006	9,022,440
2007	8,846,880
2008	8,465,520
2009	8,335,880
2010	9,846,760

Figure 1: Tonnage of Crude and Other Oil Product across JFB Channel



Stockton Ship Channel

Historical throughput data for the Port between the years 2002 and 2011 is shown in the table and graph below. As the data shows, agricultural commodities like rice, fertilizer products, and molasses have been very stable at the Port over the last decade. The residential construction boon that ended in 2007 brought large amounts of imported cement into the Port as regional suppliers were unable to keep up with demand. Since then very little cement has been imported at the Port, but imports are expected to return (albeit at more modest levels) in the next few years as the housing recovery progresses. Exports of coal and iron began in 2011, which were responsible for a large spike in shipments over 2010. In 2011 exports surpassed imports for the first time in the Port's history.

Table 2: Tonnage of Major Commodities through the Port, 2002 through 2011

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Ammonia	190,511	208,663	210,485	191,455	161,302	251,781	186,949	170,964	177,970	184,108
Bagged Fertilizer	21,587	13,789	5,702	6,697	3,532	2,654	3,443	9,319	13,359	N/A
Bagged Rice	221,123	135,854	153,411	194,485	130,004	130,005	155,628	207,214	176,878	204,440
Bulk Fertilizer	26,287	35,399	30,272	31,960	39,056	66,990	26,253	43,555	181,392	129,904
Bulk Rice	69,291	27,337	15,900	89,767	22,454	25,616	77,537	61,834	60,000	N/A
Cement	444,864	456,006	1,102,051	1,785,417	2,116,971	1,150,997	153,244	107,980	185,817	65,000
Coal	0	0	0	0	0	0	0	0	0	90,168
Cottonseed	187,317	0	0	0	0	0	0	21,987	0	41,497
Iron Ore	0	0	0	0	0	0	0	0	0	825,132
Liquid Fertilizer	325,965	269,320	321,729	418,959	329,427	344,350	235,827	158,713	351,347	449,348
Machinery	6,802	4,984	4,329	1,998	1,174	0	0	0	0	7,096
Molasses	204,484	182,563	211,748	150,546	169,010	174,735	174,956	165,199	179,319	218,669
Slag	0	0	0	39,360	71,926	73,551	80,521	76,000	58,130	95,822
Steel	134,106	16,786	95,273	67,046	295,230	217,918	125,841	30,197	55,266	31,222
Sulfur	189,655	232,184	263,815	261,825	265,323	256,690	253,862	241,046	237,667	216,377
Urea	31,612	46,554	29,735	40,938	30,326	57,719	29,532	0	0	80,215
Total	2,271,259	1,819,773	2,704,741	3,623,841	3,766,987	2,824,473	1,627,359	1,311,863	1,720,869	2,948,912

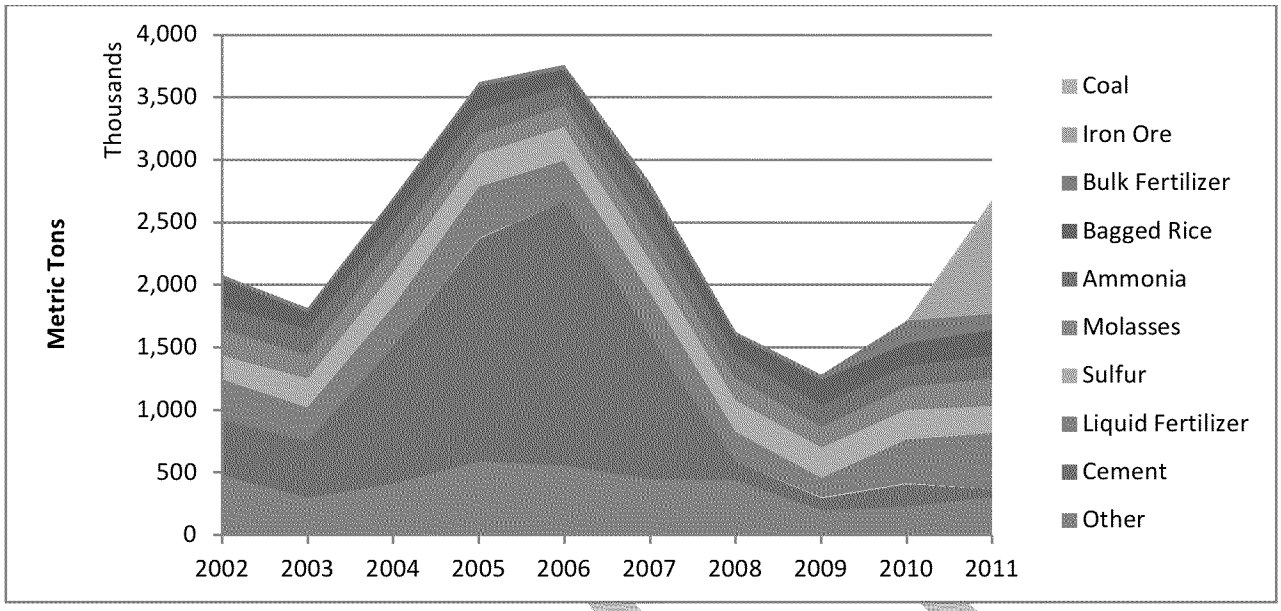


Figure 2: Stacked Area Graph of Selected Major Commodities Tonnage over Time

GEO-TECHNICAL ENGINEERING

STATUS UPDATE

Geotechncial Study for the SF Bay to Stockton Deepening Project

10 January 2013

The Geo-Science Section is currently working on a geotechnical study of the proposed project. The purpose of the study is to develop the geotechnical parameters that are needed to prepare the design of the channel banks, and if needed, associated slope stabilization features, and berms to contain the dredged material at select placement sites. To date, existing information on geology, seismicity, subsurface conditions, topography and bathymetry have been compiled and reviewed. These references include, but are not limited to:

References

- DWR. 1956-1958. Plan and Profile of Borings
- Kleinfelder. 2003. Boring logs for Rough and Ready Island (West Complex) Wharf Evaluation
- Roger Foot Associates, Inc. 1990. Boring Logs (Sherman Island Levee)
- U.C. Berkeley. 2011. A Method to Determine Probability of Failure Caused by Seepage Under Levees, Sherman Island Pilot Project
- URS Corporation and Jack R. Benjamin & Associates. 2009. Phase 1 Report of the Delta Risk Management Strategy (DRMS)
- URS Corporation and Jack R. Benjamin & Associates. 2011. Phase 2 Report of the Delta Risk Management Strategy (DRMS)
- USACE. 1973. Boring Logs for John Baldwin Ship Channel
- USACE. 2000-2006. LTMS Samples

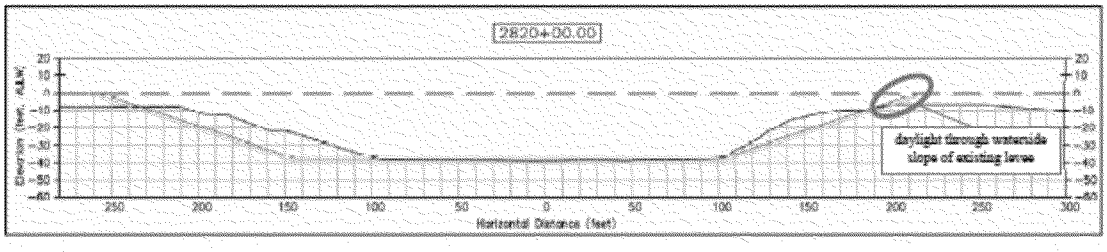
CHANNEL BANKS

Preliminary screening has been performed to identify locations that may be spatially constraining. Steps 1 through 12 of the screening methodology outlined below, have been completed. Steps 12 through 16 of the methodology have yet to be completed.

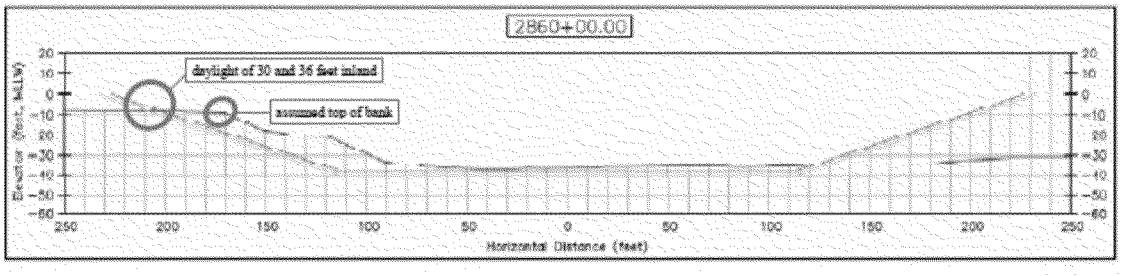
Methodology for Preliminary Screening of Spatially Constrained Locations

1. the most recent bathymetry data, dated 28 February 2012 through 25 April 2012, was collected from SPK
   - bathymetry data came in a .xyz file
2. a surface of the bathymetry data was created in AutoCAD
3. the most recent topography data, dated 2007, was collected from DWR
   - topography data was collected from LiDAR surveys of the Delta for the DWR-URS Delta Risk Management Study (DRMS)
4. a surface of the topography data was created in AutoCAD
5. the surface of the topography data was superimposed onto the surface of the bathymetry data
6. channel cross-sections were cut through the topography and bathymetry surfaces along the proposed channel alignment to capture the "existing" condition at equally spaced intervals
   - the cross-sections are not actually representations of the existing condition since the topography is based on data collected in 2007
7. channel cross-sections were cut through the topography and bathymetry surfaces along the proposed alignment to show "existing" condition of the channel
8. a template with channel sideslopes of 3H:1V and channel bottom at -38 feet MLLW and -40 feet MLLW were superimposed onto the channel cross-sections

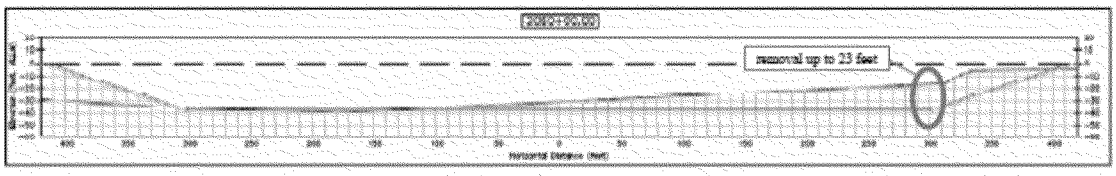
9. locations where the 3H:1V sideslopes daylight through an existing levee were identified



10. locations where the 3H:1V sideslopes daylight inland (such that the channel "cut" encroaches onto adjacent land) were identified
    - checked against linear distance between top of banks on Google Earth



11. locations where the "existing" slope of the banks are less steep than 3H:1V and where significant material will need to be removed above the new channel toes, were identified
    - significant amount was assumed to be a cut greater than 10 feet thick above the new toe



12. locations identified in steps 9 through 11 were summarized in a plan and table

Remaining steps to be completed for assessment of post-construction bank condition:

13. for the locations identified in the table above, determine whether the realignment is feasible
    - work with Civil Design (and get input from bar pilots)
    - compare with "fragile" levee locations identified from DRMS study
14. if realignment at the locations identified in the table above is not feasible, determine the shallowest slopes needed to maintain the proposed channel bottom width given the surficial spatial constraint
15. compare steepness of shallowest needed slope with existing slope
    - if existing slope is steeper than what is needed, assume soils can support necessary slope for preliminary screening
    - if existing slope is shallower than what is needed, characterize soils and perform slope stability analysis to determine steepest possible bare earthen slope
16. if slopes cannot be steepened to maintain proposed channel bottom width, determine feasibility and estimate cost of:
    - land acquisition
    - steepening with use mitigation measures

Preliminary Findings

Findings from the preliminary screening based on what has been done so far, are summarized in the table and plan below:

Deepening to -38' MLLW

LOCATION		REASON FOR CONCERN				COMMENTS
Station	Bank	Spatial Constraint	Significant Volume Removal	Existing Slope Less Steep than Proposed Slope	Subsurface Soils	
2060+00	Left	---	removal of up to 21 feet thick material above toe[2]	---	TBD	
2140+00	Right	---	removal of up to 15 feet thick material above toe[2]	---	TBD	
2214+00 - 2234+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2480+00	Left	daylights inland by 23 feet[2]	---	---	TBD	
2623+00 - 2630+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2658+00 - 2665+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2710+00 - 2718+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2800+00	Right	daylights inland by 33 feet[2]	---	---	TBD	Existing slope 2.3H:1V
2813+00 - 2836+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2820+00	Right	daylights inland by 20 feet[2]	removal of 14 feet thick material above toe[2]	---	TBD	
2840+00	Right	daylights inland by 10 feet[2]	---	---	TBD	
2847+00 - 2882+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2860+00	Right	daylights inland by 30 feet[2]	removal of 15 feet thick material above toe[2]	---	TBD	
2900+00	Right	---	removal of 15 feet thick of material above toe[2]	---	TBD	
2900+00	Left	---	removal of 12 feet thick of material above toe[2]	---	TBD	

Deepening to -40' MLLW

LOCATION		REASON FOR CONCERN				COMMENTS
Station	Bank	Spatial Constraint	Significant Volume Removal	Existing Slope Less Steep than Proposed Slope	Subsurface Soils	
2060+00		---	removal of up to 23 feet thick material above toe[2]	---	TBD	
2140+00	Right	---	removal of up to 17 feet thick material above toe[2]	---	TBD	
2214+00 - 2234+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2480+00	Left	daylights inland by 29 feet[2]	---	---	TBD	
2623+00 - 2630+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2658+00 - 2665+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2710+00 - 2718+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2800+00	Right	daylights inland by 38 feet[2]	---	---	TBD	Existing slope 2.3H:1V
2813+00 - 2836+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2820+00	Right	daylights inland by 23 feet[2]	removal of 16 feet thick material above toe[2]	---	TBD	
2820+00	Left	daylights through waterside levee slope[2]			TBD	
2840+00	Right	daylights inland by 18 feet[2]	---	---	TBD	
2847+00 - 2882+00	CL	surface channel width narrower than 3H:1V template[1]	---	---	TBD	
2860+00	Right	daylights inland by 36 feet[2]	removal of 17 feet thick material above toe[2]	---	TBD	
2900+00	Right	---	removal of 17 feet thick of material above toe[2]	---	TBD	
2900+00	Left	---	removal of 14 feet thick of material above toe[2]	---	TBD	

NOTES:

1. Based on 2009 Channel Alignment (2009ChannelAlignment.shp) superimposed onto aerial (ESRI_Imagery_World_2D.jpeg).
2. Based on 3H:1V template superimposed on 2012 bathymetry surface as shown on Cross Section Only (13DEC2012).dwg.
3. Bank designation is based on a channel cross-section facing downstream.
4. Bathymetry may have changed since data was collected for the 2012 survey.
5. Areas of concern are only listed for where dredging to the proposed elevation of -38 and -40 feet MLLW may cause the channel bank(s) to encroach onto adjacent property or where slope stability may be an issue. Locations and areas of concern related to placement sites are not identified here.

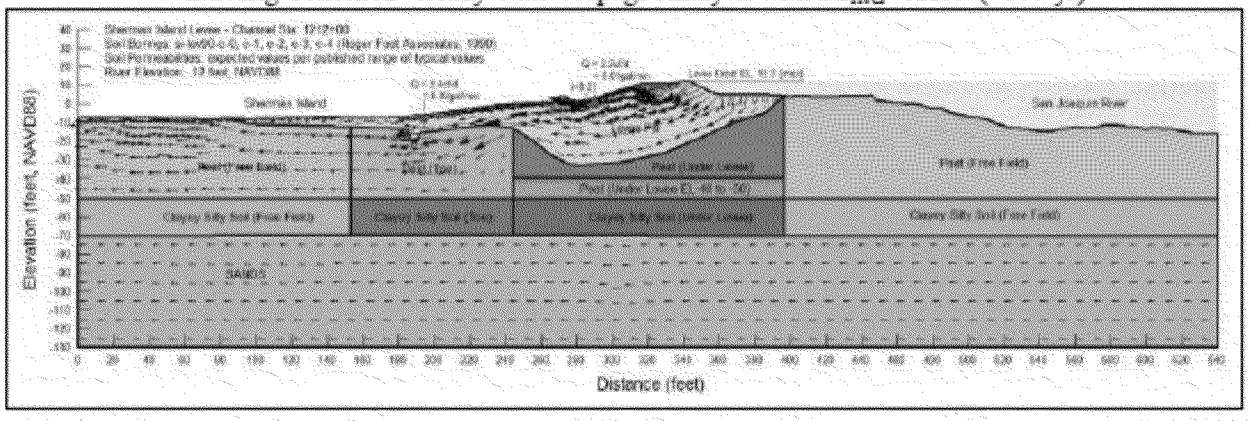
PLACEMENT SITES

Sherman Island is considered to be one of the main potential placement sites for the dredged material from the eastern reach. Preliminary geotechnical analyses were performed to assess the "existing" condition and end-of-placement condition of the levee and foundation at one location adjacent to the San Joaquin River. The location was selected based on insight from the RESIN (Resilient and Sustainable Infrastructure Networks) research team as being a critical location along the Sherman Island levee. The "existing" condition at approximately channel Station 1212+00 is based on 2007 topography data and 2010 bathymetry data. The end-of-placement condition assumes that the dredged material is placed up to an elevation of 12 feet NAVD88, consists primarily of water, and has nearly zero strength.

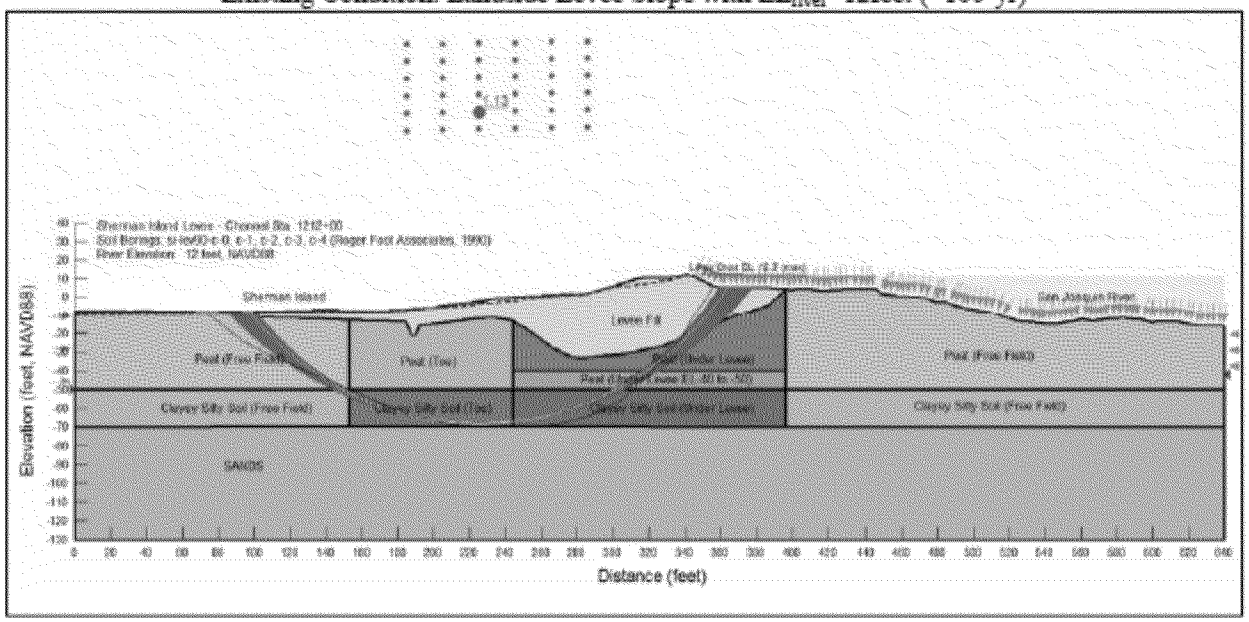
Results

Per EM 1110-2-1913 (USACE, 2000), the minimum required factor of safety against slope instability for the long-term (steady state) condition is 1.4.

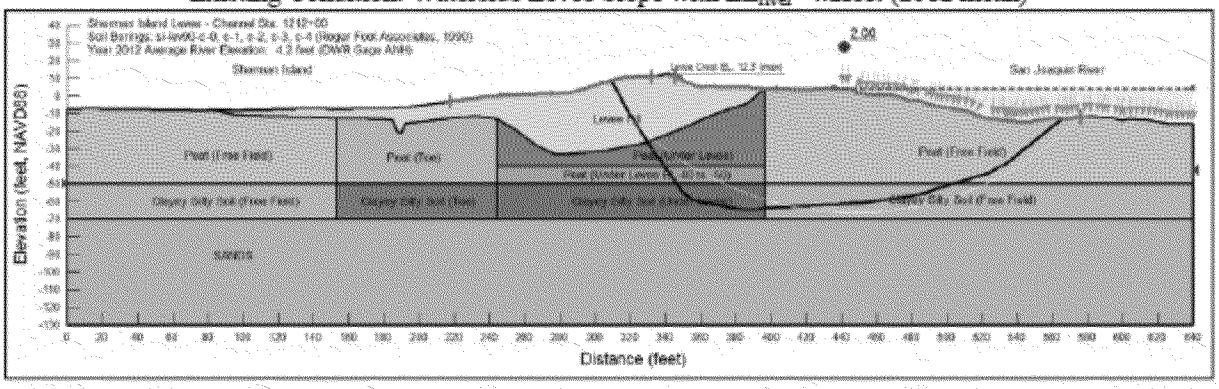
Existing Condition: Steady State Seepage Analysis with EL_{river}=12feet (~100-yr)



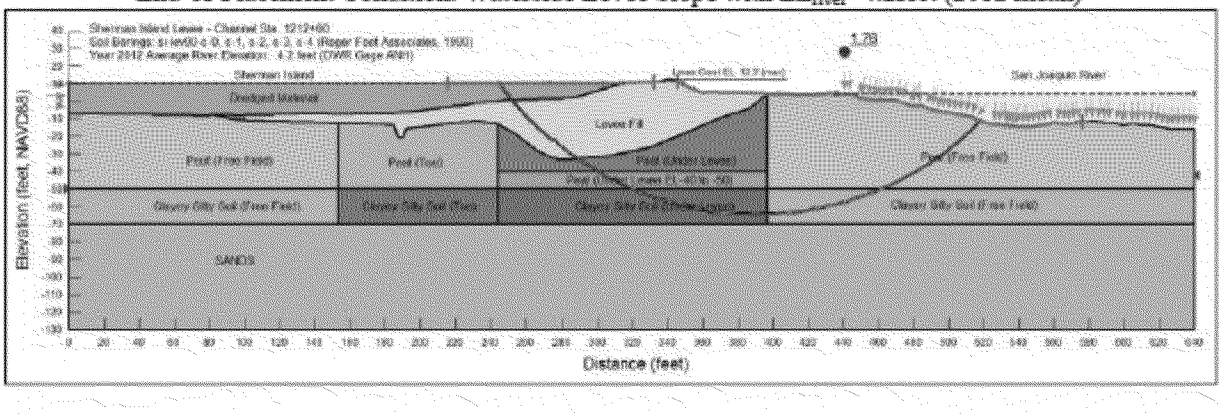
Existing Condition: Landside Levee Slope with EL_{river}=12feet (~100-yr)



Existing Condition: Waterside Levee Slope with EL_{river}=4.2feet (2012 mean)



End-of-Placement Condition: Waterside Levee Slope with EL_{river}=4.2feet (2012 mean)



Summary of Preliminary Geotechnical Analyses for Sherman Island (~Sta. 1212+00)

Condition	River EL. [feet, NAVD88]	Landside Slope F.S.	Waterside Slope F.S.	EM 1110-2-1913 F.S.
Existing	12 (100-yr)	1.13	---	1.40
	4.2 (mean)	---	2.00	1.40
End-of-Placement (EL.12)	4.2	---	1.76	1.40

Geotechnical analyses of critical locations along the banks and placements sites will be performed in FY2013.

CIVIL DESIGN

A strategy will need to be developed for determining the cost effective combination of using Placement Sites and booster pumps as well as clamshell dredging and hydraulic dredging throughout the eastern reach. The cost to dredge is usually estimated in terms of a unit cost per cubic yard. Typical rates range from $5 (five) to $30 (thirty) dollars per cubic yard. Factors that affect the cost include the type of dredging plant (mechanical clamshell, cutterhead hydraulic, or hopper), the type of dredge material (sand, clay, or rock), and the distance the material is required to be hauled or pumped.

There are two types of dredge plants that are being considered for the Project, a hydraulic cutterhead dredge plant and a mechanical clamshell dredge plant. If conditions are ideal, hydraulic dredging is the least costly type of dredging. The advantage of using a hydraulic dredge is that the material is only being handled once. A clamshell dredge must load the material in a scow, which must be hauled by tugboat to the placement site where it will be re-handled and loaded into the upland placement site using excavators or another modified hydraulic dredge unloader. The disadvantage of the hydraulic dredge is that the material can only be pumped a limited distance and there is a considerable amount of water associated with hydraulic dredging. The placement sites must have the additional capacity to handle not only the dredged material but also the water needed to enable the dredged material to be pumped as slurry. This additional capacity requirement may necessitate additional earthwork to raise containment berms and levees for some, if not all, placement sites. The distance the slurry can be pumped can be increased using a booster pump but that also increases the cost per cubic yard and reduces the overall efficiency of the operation. As the distance between the dredge site and placement site increases, and more booster pumps are added to the hydraulic dredge system, and considering any additional placement site preparation, a clamshell dredge operation may become more cost effective.

The types of dredge materials range from silt and clay material to sand and rock material. Silt and clay can usually be dissolved into a water solution, or slurry, that can be pumped long distances by a hydraulic dredge. Sand material can also be pumped by a hydraulic dredge but the distance will be shorter and more water is needed to keep the material mobilized in the pipeline. If the material is mostly rocks, a clamshell dredge will most likely be used. Conducting soil sampling along the project will provide more detailed information, which will support more accurate planning and will also determine re-use opportunities for the dredge material. Soil sampling is vital to determining the feasibility of dredging long distances and properly placing material at stockpile and re-use sites.

Previous evidence from the study on the Sacramento DWSC shows that hydraulic dredging can effectively transport material up to 10,000 to 15,000 feet, depending on the type of material and the size of the hydraulic dredge. In order to pump material farther than 15,000 feet a booster pump is required to increase pressure within the pipeline. Each booster pump can transport the material an additional 10,000 to 15,000 feet. Ideally, there should be a Placement Site every 10,000 to 15,000 feet to avoid the additional costs of the booster pump. However, additional Placement Sites also incur costs for acquisition, planning, permitting, and developing. Therefore an analysis is required to compare costs of booster pumps to placements sites.

One factor that will significantly affect the cost is the volume of material required to be dredged. The issue is accurately estimating how the material required to be dredged will be distributed and placed in upland sites. Certain Placements Site have a maximum capacity, once that capacity is reached, the dredging operation will have to transport material to another Placement Site which may be farther away.

SF TO STOCKTON DEEPENING SAMPLING & ANALYSIS PLAN (SAP)

1.0 CONDITIONS IMPOSED ON SAP

1.1 Consolidation and Minimization of Sampling and Testing

Because the funding for this SAP was limited and because it was unknown if future funding would become available, Project Management directed that the SAP would need to cover the various proposed SF to Stockton channel deepening combinations in one sampling and analysis episode requiring the minimal amount of sampling and testing.

1.1.1 Combining Projects

The San Francisco to Stockton Channel Deepening Project actually includes two projects combined. The first project involves the deepening of the West Richmond Channel and Pinole Channel to a total depth of 47 feet MLLW (45 feet Project plus 2 feet over-depth) in order to accommodate a fully loaded design liquid tanker visiting refineries at the Richmond and Avon Terminals. The second project involves the deepening of the Suisun Channel and Stockton Channel Reaches 1-6 and Reach 8 to a total depth of 42 feet MLLW (40 feet project plus feet over-depth) in order to accommodate a fully loaded dry bulk design cargo vessel to the Port of Stockton. Deepening of Stockton Reach 7, which will act as a sediment trap, will be to a total depth of 47 feet MLLW (45 feet Project plus 2 feet over-depth). Based on recent preliminary salinity mitigation test results, the deepening depth could be changed to 42 feet MLLW (40 feet project plus feet over-depth) for the entire project in order to avoid degradation of the water quality.

1.1.2 Minimizing Required Sampling

1.1.2.1 Sample from Dredged Layers

1.1.2.1.1 Number of Samples Based on Existing Criteria

At present, the Dredged Materials Management Office (DMMO) has sampling guideline for project volumes from 5,000 to 500,000 cubic yards which follow a pattern of reduction in samples/volume as the total project volume increases. At a volume of 500,000 cubic yards a minimum of 6 four-point (location) composite samples are required. This translates to one composite sample per 83,333 cubic yards of dredged material and one location sample/20,833 cubic yards of sediment. Based on existing DMMO guidance the 28,000,000 San Francisco to Stockton Deepening Project would require samples

from a minimum of 1,344 sample locations in the layers of sediment to be dredged. Without even the cost of sediment analysis considered, the cost of sampling from this many sampling locations would be a huge cost.

1.1.2.2.1 Proposal for Reduction in the Number of Samples based on Other Large Projects

The approach was taken to try to develop new guidelines for required sample volumes based on recent large dredging projects in the general project area. The two largest projects the Sacramento River Deepening and the Oakland Harbor Deeping Projects had sample volumes as large as 145,475 cubic yards/sample location and 100,000 cubic yards/sample with average sample location volumes of 66,000 and 37,036 cubic yards/sample location respectively. Based on these larger projects there appears to be room to reduce the number of samples required to one-half to one-seventh the number of samples required by the present DMMO guidelines. In reducing the number of samples required, the number sediment chemistry analysis would be proportionately reduced.

1.1.2.2 Sample from Z Layers

1.1.2.2.1 Z Layer Sample Collection

Originally two set of Z Layers were to be collected an upper set from 42.0' – 42.5' MLLW in all channels and a lower set from 47.0' – 47.5' MLLW in the deeper western channels. It now appears that the lower set of Z Layer Samples will not be necessary if the entire project is dredged to only to a total depth of 42.0' MLLW.

1.1.2.2.2 Affect of Reduction in Sample numbers

In any case a reduction in the number of required sediment samples will cause a proportional reduction in the number of required Z Layer Samples.

1.2 Multiple Jurisdictional Approval Boards

Because of the extent of the deepening project from San Francisco to Stockton dredging and disposal of dredged materials falls under two geographical separate geographical dredging boards – The Dredged Materials Management Office for the Channels West of Antioch and the Central Valley Dredging Agencies for the Channels east of Antioch.

1.2.1 Multiple Approval of SAP

Both the DMMO and the Central Valley Dredging Agencies will need to approve the SAP

1.1.1 Multiple Jurisdictions

The jurisdiction for dredging activities and placement activities will depend on the geographical location of the activity.

1.1.1 Different Testing Requirements

The sediment testing will be determined the geographical location of the placement site.

2.0 INITIAL ATTEMPT TO PRESENT NEW SAMPLING GUIDELINES TO DMMO

An attempt was made to present new sampling guidelines for the San Francisco to Stockton Deepening project to the DMMO. The DMMO refused to meet on the proposed guidelines because all recent large dredging projects were not discussed, and the guideline criteria were too narrow to apply to all projects. See *Proposal for Guidelines for Determining the Number of Sediment Samples Needed to Evaluate the Sediment Suitability for Placement at Approved Placement Sites for Dredging Projects with Total Sediment Volumes Greater than 500,000 Cubic Yards*.

2.1 Large Projects Discussed

The Proposal mainly discussed only the Oakland 50' Deepening Project.

2.2 Guideline Criteria

The Proposal gave a maximum sample volume/sample for 4 levels of concern.

3.0 PRESENT SAP

The present SAP tries to address some of the concerns that the DMMO raised over general sampling criteria for large projects.

3.1 Large Projects Discussed

The SAP discusses all the four recent large dredging projects in the Bay Area - Oakland Harbor 50' Deepening, Sacramento River Deepening, Redwood City Harbor Deepening, and Brooklyn Basin..

3.2 Range of Criteria

The present SAP gives the range of sample criteria based on the three large projects that have been sampled – Oakland Harbor 50' Deepening, Sacramento River Deepening, and Brooklyn Basin.

4.0 RECENT SAP REQUIREMENTS

Recent DMMO SAP requires that are only recently being added to SAP's has complicated the San Francisco to Stockton SAP. These requirements include the three dimensional mapping of channels by chemical concentrations and potential contaminant sources. The sediment chemistry data has just been entered into the data bank and the potential contaminant source locations still need to be mapped. Also a system needs to be worked out on how best to display the sediment chemistry data to make it meaningful.

7. 6 Final Array of Alternative Plans

TO BE DETERMINED

8.0 Evaluation of Final Array of Alternative Plans

TO BE DETERMINED

9.0 Comparison of Final Array of Alternative Plans / Decision Criteria

TO BE DETERMINED

10.0 Selecting a Recommended Plan

The recommended plan will be based upon environmentally acceptable measures, sound and safe engineering and construction standards, and reasonably maximized net NED economic benefits.

11.0 Timeline

- Decision Point (DP) 1-- March 2013
- DP 2 --[Tentatively selected plan identified] –July 2013
- DP 3-- [(Alternative Formulation Briefing) Conference] – November 2013
- DP 4-- [Draft GRR & Release draft EIS/R to public] – February 2014
- Chief's Report Phase -- [Submit Final GRR to MSC] - May 2014
- DP 5-- [Chief's Report to CWRB] - July 2014
- Signed Chief's Report to ASA(CW) - September 2014